

ment of Agriculture Official Standards for Apricots (1958); and "reasonably uniform in color" means that the apricots in the individual container do not show sufficient variation in color to materially affect the general appearance of the apricots.

(Secs. 1-19, 48 Stat. 31, as amended; 7 U.S.C. 601-674)

Dated: June 24 1965.

PAUL A. NICHOLSON,
Acting Director, Fruit and Vegetable Division, Consumer and Marketing Service.

[F.R. Doc. 65-6805; Filed, June 28, 1965; 8:49 a.m.]

Title 14—AERONAUTICS AND SPACE

Chapter I—Federal Aviation Agency

[Regulatory Docket No. 4081; Amdt. Nos. 1-9; 61-18]

PART 1—DEFINITIONS AND ABBREVIATIONS

PART 61—CERTIFICATION: PILOTS AND FLIGHT INSTRUCTORS

Biennial Expiration and Renewal of Flight Instructor Certificates and Increased Supervision of Student Pilot Activities

The purpose of these amendments to Parts 1 and 61 of the Federal Aviation Regulations is to provide for higher standards of flight instruction and closer control over student pilot activities. This action was published as a notice of proposed rule making and circulated as a Federal Aviation Agency Notice No. 64-18 (29 F.R. 4738).

It was proposed in Notice No. 64-18 to delete the definition of "dual instruction" now contained in Part 1 and to make certain amendments to Part 61 that will—

- (1) Prohibit the giving of flight instruction required to qualify for a pilot certificate or rating by any person except a certificated flight instructor;
- (2) Provide improved standards for the certification of flight instructors and raise the standards of flight instruction;
- (3) Give a certificated flight instructor additional responsibilities; and
- (4) Provide for closer supervision of student pilot activities. The comments received in response to Notice 64-18 were generally favorable to the proposed amendments.

The biennial expiration and renewal of flight instructor certificates (§ 61.9 (b)) was the most controversial item in the proposed amendments. Many arguments, for and against, were received in response to this item. However, while some of the comments that opposed the amendment were based upon the opinion that the renewal was unnecessary, others were based on an assumption that a retesting on all items of the oral and flight test would be required for each renewal, regardless of the experience and compe-

tency of the applicant. Comments favoring the renewal requirement expressed a belief that there is a need for higher standards of flight instruction and that the proposed requirement should result in more proficient instructors and safer pilots. In view of the importance of this aspect of the proposal, the Agency carefully evaluated its position as set forth in the proposal and believes that the rule should be adopted as proposed. Under the proposed § 61.177, and as adopted in this rule, an applicant for the renewal of a flight instructor certificate should be prepared to take the practical tests prescribed by § 61.173 if his certificate has expired at the time of his application for renewal.

An applicant holding a current certificate at the time of application should also be prepared to take the practical tests prescribed in § 61.173. However, in the case of a flight instructor with a record of satisfactory training and performance by his students, the rule permits little or no retesting for the renewal. On the other hand, in the case of an instructor who has had little or no instructing activity, or if the performance of his students indicates a possible deficiency in his instructing techniques, a renewal test will be given the applicant on those items of the test prescribed in § 61.173 that the examining inspector believes are necessary to determine the applicant's continued competency. Instructions for the handling of renewal applications by inspectors and pertinent advisory material to the public will be issued well in advance of the time when renewals will first be required.

Section 61.21(a) (4) excepts an applicant for a type rating only from having a flight instructor's recommendation. In order to keep the requirements consistent in the case of retesting an applicant for a type rating only after failure, § 61.27(b) is amended to exclude the applicant for a type rating only from the requirements of obtaining a qualified flight instructor's recommendation before retesting.

The proposed general limitations in § 61.73(c) were generally favored by persons commenting on Notice No. 64-18. However, some expressed opposition to the requirements for flight instruction within the preceding 90 days and flight instructor authorization for each solo cross-country flight by a student pilot. The purpose of these requirements is to insure that the student pilot avails himself of the advice and counsel of a flight instructor during the important formative period of his training.

The Agency has considered the comments on these items and has determined that these requirements should not apply after a student pilot has acquired the aeronautical experience required for a private pilot certificate, and he has an endorsement by a flight instructor that the student pilot is considered capable of exercising solo cross-country privileges without a flight instructor's supervision and is considered competent to make solo flights, or solo cross-country flights, or both, without mandatory periodic flight checks. Present paragraph (c) is retained and proposed paragraphs (c) and

(d) have been amended to provide for this exception and are redesignated as paragraphs (d) and (e) to § 61.73.

Some comments indicate that the words "flight plan" as used in proposed § 61.73(d) were misinterpreted as meaning a flight plan filed with air traffic control. The Agency, of course, encourages the filing of VFR flight plans; however, the words "flight plan" in this section meant the student's preflight preparation or planning for his flight. In order to eliminate misinterpretation, the words "student's preflight preparation and planning" are substituted for "flight plan" in new § 61.73(e).

A number of persons misinterpreted proposed § 61.170 as requiring that a flight instructor who instructs in airplanes must hold an instrument rating on his pilot certificate. An instrument rating is required only if the applicant wishes to be rated to give instrument flight instruction.

The proposed § 61.179 provides that required glider flight instruction may be given only by certificated glider flight instructors. However, a provision was included that would allow a commercial glider pilot to obtain a flight instructor certificate with a glider rating or a certificated flight instructor to obtain a glider rating on his certificate, if the applicant has given at least 10 hours of glider flight instruction as a commercial glider pilot within the 12 months before the date of his application. Representatives of several soaring clubs recommended a reduction in the 10-hour instruction requirement. They pointed out that most people who learn to fly gliders have had previous powered aircraft experience and, therefore, require little instruction for a glider checkout. The Agency has considered these comments and has determined that a requirement of 2 hours of flight instruction in gliders, including at least 10 flights, provides a reasonable basis on which to issue certificates or ratings under this special issue provision. Section 61.179 has been amended to indicate this change.

Proposed § 61.173(b) (2) in Notice 64-18 stated that an applicant would be tested on flight maneuvers appropriate to the instructor rating sought. The Agency intended to implement this section by issuing advisory material and guidelines covering the specific maneuvers. However, after considering comments received on this method, the Agency has determined that the specific maneuvers should be listed in the rule in order to give the widest circulation to the public. Advisory material and guidelines will be issued in addition to inserting the lists in the rule. Section 61.173 (b) (2) has been changed to include lists of the appropriate flight maneuvers. These lists are substantially the same as those contained in the present regulations; however, they have been presented in a format that indicates more specific testing categories.

Interested persons have been afforded an opportunity to participate in the making of this regulation, and due consideration has been given to all relevant matter presented.

In consideration of the foregoing, Parts 1 and 61 of the Federal Aviation Regulations are amended effective September 26, 1965, as follows:

1. By striking out the definition "Dual instruction" in § 1.1 of Part 1.

2. By redesignating paragraphs (d) and (e) of § 61.3 of Part 61 as paragraphs (e) and (f), respectively, and adding a new paragraph (d) reading as follows:

§ 61.3 Certificates and ratings required.

(d) *Flight instructor certificates.* Except in the case of lighter-than-air flight instruction or as otherwise specifically provided, no person other than the holder of a flight instructor certificate issued by the Administrator with an appropriate rating on that certificate may—

(1) Give any of the flight instruction required to qualify for a solo flight, solo cross-country flight, or for the issue of a pilot or flight instructor certificate or rating;

(2) Endorse a pilot logbook to show that he has given any flight instruction; or

(3) Endorse a student pilot certificate.

Notwithstanding any other provision of this part, the holder of a commercial pilot certificate with a glider rating that was valid on September 25, 1965, may exercise the privileges of the holder of a flight instructor certificate with a glider rating on that certificate until September 26, 1966.

3. By amending § 61.9(b) to read as follows:

§ 61.9 Duration of certificates.

(b) *Flight instructor certificates.* (1) A limited flight instructor certificate expires at the end of the 24th month after the month in which it was issued, but the holder of an expired limited flight instructor certificate may obtain a flight instructor certificate under § 61.176.

(2) A flight instructor certificate issued before September 26, 1965, expires at the end of the holder's next birth month following September 1966, but the holder thereof may obtain another certificate under § 61.177.

(3) A flight instructor certificate issued or renewed after September 25, 1965, expires at the end of the 24th month after the month in which it was issued or renewed, but the holder thereof may obtain another certificate under § 61.177.

(4) A flight instructor certificate is effective only while the holder has a current pilot certificate as prescribed in § 61.172.

4. By striking out the words "or a commercial glider pilot" in § 61.17(c).

5. By amending § 61.21 to read as follows:

§ 61.21 Prerequisites for flight tests.

(a) To be eligible for a flight test for a certificate, or an aircraft or instrument rating issued under this part, the applicant must—

(1) Have passed the written test (if required) within the 24 months before the date he takes the flight test;

(2) Have the applicable aeronautical experience prescribed in this part;

(3) Hold a medical certificate appropriate to the certificate he seeks; and

(4) Except when applying for a type rating only, have a written statement (from a certificated flight instructor with an appropriate rating on his flight instructor certificate) certifying that he has given the applicant flight instruction in preparation for the flight test and considers him ready to take the test.

(b) Notwithstanding subparagraphs (1) and (4) of paragraph (a) of this section, an applicant for an airline transport pilot certificate who has been continuously employed as a pilot or as a pilot assigned to flight engineer duties by, and has continuously participated in an approved pilot training program of, a U.S. air carrier or commercial operator since no later than 24 months after passing the written test, or has been continuously employed as a pilot by, and has continuously participated in a pilot training program of, a U.S. scheduled military air transportation service after passing the written test, may take the flight test for that certificate as long as he continues in that employment and pilot training program. In addition, subparagraph (4) of paragraph (a) of this section does not apply to an applicant for a pilot certificate with a lighter-than-air category or associated class rating.

6. By amending the parenthetical expression in § 61.27(a) to read "(other than an airline transport pilot certificate or associated rating or a pilot certificate with a lighter-than-air category or associated class rating)" and by amending § 61.27(b) to read as follows:

§ 61.27 Retesting after failure.

(b) *Flight test.* An applicant for a certificate or rating under this part (other than an applicant for a type rating only, an airline transport pilot certificate or associated rating, or a pilot certificate with a lighter-than-air category or associated class rating) who fails a flight test for that certificate or rating may apply for retesting upon presenting a statement from a certificated flight instructor with an appropriate rating on his flight instructor certificate that he has given additional instruction to the applicant and now considers the applicant ready for retesting.

7. By striking out the reference "§§ 61.47 or 61.177(c)" in § 61.39(a) and inserting the reference "§ 61.47" in place thereof.

8. By striking out the words "or a commercial glider pilot" in § 61.63(a) (2) (iii).

9. By striking out the parenthetical expression "(or a commercial glider pilot in the case of gliders)," in § 61.63(a) (3).

10. By striking out the word "and" at the end of § 61.65(b) (6) and adding a new subparagraph (8) reading as follows:

§ 61.65 Airplane operations: flight area limitations.

(b) * * *

(8) The use of the magnetic compass; and

11. By striking out the word "and" at the end of § 61.67(b) (2) and adding a new subparagraph (4) reading as follows:

§ 61.67 Rotorcraft operations: flight area limitations.

(b) * * *

(4) The use of the magnetic compass; and

12. By amending § 61.69(b) to read as follows:

§ 61.69 Glider operations: flight area limitations.

(b) He has received flight instruction (from a certificated flight instructor with an appropriate rating on his flight instructor certificate) in cross-country navigation by reference to aeronautical charts and the magnetic compass; and

13. By striking out the words "or a commercial glider pilot," in § 61.69(c).

14. By adding the following new paragraphs at the end of § 61.73:

§ 61.73 General limitations.

(d) A student pilot may not operate an airplane or rotorcraft in solo flight unless within the preceding 90 days—

(1) He has received flight instruction in that category of aircraft from a certificated flight instructor with an appropriate rating on his flight instructor certificate;

(2) He has demonstrated to that flight instructor that he is competent to solo that category of aircraft; and

(3) That flight instructor has endorsed in the student pilot's logbook that he has given that flight instruction and found the student competent for solo flight.

However, this paragraph does not apply if the student pilot meets the requirements of paragraph (c) of this section, has acquired the aeronautical experience required for a private pilot certificate, and obtains an endorsement by a flight instructor that the student pilot is considered competent to make solo flights without mandatory periodic flight checks.

(e) A student pilot may not operate an airplane or rotorcraft in solo cross-country flight until a certificated flight instructor with an appropriate rating on his flight instructor certificate has reviewed the student's preflight preparation and planning, determined that the student is competent to make the flight, and has so endorsed the student's pilot logbook. The student must carry that logbook on each solo cross-country flight. However, a student pilot may perform repeated solo cross-country flights over a specified course of not more than 50 miles in length, without an endorsement for each flight, if a certificated flight instructor with an appropriate rating on his flight instructor certificate has—

(1) Given him flight instruction over the course in both directions, and in takeoffs and landings at both landing areas involved; and

(2) Found that the student is competent to make flights over the course without an authorization for each flight and has so endorsed the student's pilot logbook.

However, this paragraph does not apply if the student pilot has acquired the aeronautical experience required for a private pilot certificate and obtains an endorsement by a certificated flight instructor that the student pilot is considered competent to exercise solo cross-country privileges without a flight instructor's supervision.

15. By striking out the first sentence of § 61.131(d).

16. By amending Subpart F of Part 61 to read as follows:

Subpart F—Flight Instructors

- Sec.
- 61.170 Eligibility requirements: general.
 - 61.171 Aeronautical knowledge.
 - 61.172 Aeronautical experience.
 - 61.173 Aeronautical skill.
 - 61.174 Flight instructor records.
 - 61.175 Flight instructor ratings on pilot certificates.
 - 61.176 Limited flight instructor certificates.
 - 61.177 Renewal of flight instructor certificates.
 - 61.178 Additional flight instructor ratings.
 - 61.179 Special issue of a flight instructor certificate with a glider rating.
 - 61.180 Limitations.

AUTHORITY: The provisions of this Subpart F issued under secs. 313(a), 601, and 602 of the Federal Aviation Act of 1958; 49 U.S.C. 1354, 1421, 1422.

§ 61.170 Eligibility requirements: general.

To be eligible for a flight instructor certificate with an airplane, rotorcraft, or glider category rating, or an instrument rating, a person must hold a pilot rating in that category of aircraft, or an instrument rating or airline transport pilot certificate, as appropriate, and meet the aeronautical knowledge, experience, and skill requirements of this subpart.

§ 61.171 Aeronautical knowledge.

An applicant for a flight instructor certificate must pass a written test on—

- (a) The fundamentals of flight instruction; and
- (b) The performance and analysis of flight training maneuvers appropriate to the instructor rating sought.

§ 61.172 Aeronautical experience.

An applicant for a flight instructor certificate must hold a current—

- (a) Airline transport pilot certificate;
- (b) Commercial pilot certificate without ICAO instrument or night flight limitations endorsement; or
- (c) Private pilot certificate and—

(1) Meet the aeronautical knowledge, experience, and skill requirements for the issue of a commercial pilot certificate appropriate to the category of aircraft in which he desires to give flight instruction; and

(2) Meet the ICAO commercial pilot night flight requirements if he seeks an airplane category rating.

§ 61.173 Aeronautical skill.

An applicant for a flight instructor certificate must perform the following

procedures and maneuvers with regard to the giving of flight instruction appropriate to the rating sought:

(a) *Phase I—Oral and preflight tests.*

(1) Flight instructor procedures and responsibilities.

(2) Factors, conditions, and principles which control the learning process.

(3) Essential elements, objectives, and limitations of a lesson plan.

(4) Preparation of a lesson plan for flight instruction for a presolo student who has had little flight instruction or a lesson plan including the use of flight instruments, radio aids, and IFR flight clearances if the applicant is seeking an instrument rating. The lesson planned under Phase I is conducted under paragraph (b) of this section, with the examining FAA inspector acting as the student.

(b) *Phase II—Flight test.* The applicant must perform any of the following maneuvers (appropriate to the rating sought) as may be requested by the FAA inspector.

(1) *Airplane:*

(i) *Normal Operations.*

Preflight operations.
Radio communications.
Taxiing or sailing and docking.
Normal takeoffs and landings.
Straight and level flight.
Medium turns.
Steep turns.
Climbs and climbing turns.
Descents, with and without power, in straight flight and in turns.

(ii) *Ground Reference Maneuvers.*

Crosswind takeoffs and landings.
Short-field takeoffs and landings.
Soft-field takeoffs and landings.
Full-stall landings (nosewheel-type airplanes).
Wheel landings (tailwheel-type airplanes).
Power approaches.
Accuracy approaches and spot landings.
S turns across a road.
Turns about a point.
Pattern eights.
Rectangular courses and airport traffic patterns.
Slips.

(iii) *Coordination Maneuvers.*

720° power turns.
Gliding spirals.
Stalls and slow flight.
Chandelles.
Lazy eights.
Pylon eights.

(iv) *Emergency Operations.*

Forced landings.
Flight emergencies.
Emergency operation of aircraft equipment.
Engine-out emergencies (if multiengine airplane is used).
Control of airplane by reference to flight instruments.

(v) *Cross-Country Navigation.*

Dead reckoning.
Pilotage.
Radio navigation.

(vi) *Spins.* (The inspector may accept a logbook record of spin flight instruction in lieu of a demonstration. Such a record must indicate that the applicant has demonstrated satisfactory entries and recoveries from spins in both directions, and shall be certified by the flight instructor who conducted the flight instruction.)

(2) *Rotorcraft (if helicopter used):*

(i) *Normal Operations.*

Preflight operations.
Taxiing.
Vertical takeoff to hover.
Vertical landing from hover.
Normal departures from a hover.
Normal approaches to a hover.
Medium banked turns.

(ii) *Precision Maneuvers.*

Hovering; upwind, crosswind, and downwind.
Hovering turns.
Pattern flying, with constant and with changing headings.
S turns (at 500' altitude).
Rapid decelerations (quick stops).

(iii) *Special Operations.*

Simulated high-altitude takeoff.
Roll-on landing.
Crosswind takeoffs and landings.

(iv) *Emergencies.*

Emergency operation of equipment.
Autorotative landings, both to touchdown and with power recovery.
Loss of lift at altitude.
Engine failure in a hover.

(3) *Rotorcraft (if gyroplane used):*

(i) *Normal Operations.*

Preflight operations.
Taxiing or sailing and docking.
Normal takeoff and landing.
Airport traffic patterns.
Use of radio for voice communications.

(ii) *Precision Maneuvers.*

Turns about a point (45° bank at steepest point).
Gliding spirals about a point on the ground.
Right and left 720° power turns.
Maneuvering at minimum level flight airspeed.
Accuracy approaches and spot landings.

(iii) *Special Operations.*

Soft-field takeoff and landing (jump takeoff if gyroplane has this capability).
Roll-on landing and full flare landing.
Short-field takeoff and power approach and landing.
Entry and recovery from high rates of descent with and without power (recovery to be completed not lower than 300 feet above the surface).

(iv) *Emergencies.*

Forced landings (single engine only) and simulated emergencies.
Emergency operation of gyroplane equipment.

(v) *Cross-Country Flight.*

Cross-country flight planning.
Cross-country flying.
Cross-country flying emergencies.
Use of radio aids to VFR navigation.
Two-way radio communication.

(4) *Glider:*

(i) *Preflight operation.*
(ii) *Aircraft tow.*
(iii) *Auto or winch tow.*
(iv) *Stalls and slow flight.*
(v) *Accuracy 180° approaches and landings.*

(vi) *Spins.* (The inspector may accept a logbook record of spin flight instruction in gliders or light airplanes in lieu of a demonstration. Such a record must indicate that the applicant has demonstrated satisfactory entries and recoveries from spins in both directions, and shall be certified by the flight instructor who conducted the flight instruction.)

(vii) *Spirals.*

(5) Instrument:

(i) IFR Flight Planning.

Preparing an IFR flight log.
Preparing and filing an instrument flight plan.
Evaluating aircraft performance, range, and fuel requirements.
Use and limitations of required instruments and equipment.

(ii) IFR Flight Maneuvers.

Straight and level flight.
Turns, climbs, and descents.
Maneuvering at approach speeds, and stalls.
Steep turns.
Recovery from unusual attitudes.

(iii) Engine-out Maneuvers. (If test is taken in multiengine airplane.)
(iv) En route Procedures.

Copy and read-back of instrument flight plans.

Radio navigation, VOR, ADF, or LF ranges.
Radio orientation.
IFR emergencies, including use of partial panel.

(v) Terminal Area Operation.

Holding procedures.
Missed approach procedure.
Use of radar vectors and DF steers.
Compliance with departure and approach control instructions.

(vi) Standard Instrument Approach to authorized minimums (not more than 500 feet and 1 mile).

ILS.
VOR.
ADF.
LF range.

§ 61.174 Flight instructor records.

Each certificated flight instructor shall—

(a) Sign each person's logbook for each period of flight instruction that he has given that person;

(b) Record the name of each person to whom he has given flight instruction or whose student pilot certificate he has endorsed as well as the date and type of each flight instruction period or endorsement;

(c) Record the name of each person for whom he has signed a recommendation for a written or practical test under this part, the kind of tests, and the date of recommendation; and

(d) Keep each record required by paragraphs (b) and (c) of this section separately, or in his logbook, for at least 3 years.

§ 61.175 Flight instructor ratings on pilot certificates.

A person who has a flight instructor rating endorsed on his pilot certificate may not exercise the privileges of that rating, but may be issued a flight instructor certificate if he passes the appropriate tests prescribed in § 61.173.

§ 61.176 Limited flight instructor certificates.

The holder of an expired limited flight instructor certificate may be issued a flight instructor certificate with the ratings previously held on his limited flight instructor certificate, if he passes the appropriate tests prescribed in § 61.173.

§ 61.177 Renewal of flight instructor certificates.

An applicant for the renewal of a flight instructor certificate must pass the practical test prescribed in § 61.173. However, if the applicant's certificate has not expired at the time application is made for renewal, the Administrator may, based upon the flight instruction record of the applicant, limit the test to those items that he finds are necessary to determine the continued competency of the applicant.

§ 61.178 Additional flight instructor ratings.

(a) The holder of a flight instructor certificate who applies for an additional rating on that certificate must—

(1) Hold a pilot rating in that category of aircraft, or an instrument rating or airline transport pilot certificate, as appropriate to the rating sought; and
(2) Pass the written and practical tests prescribed by §§ 61.171(b) and 61.173.

(b) The holder of a flight instructor certificate issued under § 61.179(b) must also show by satisfactory evidence that he has passed the written test prescribed by § 61.171(a).

§ 61.179 Special issue of a flight instructor certificate with a glider rating.

If the holder of a commercial pilot certificate with a glider rating shows the Administrator that he has given 2 hours of flight instruction, including at least 10 flights, as a commercial glider pilot within the 12 months immediately preceding the date of his application and before September 26, 1966, he is entitled to—

(a) A glider rating on his flight instructor certificate, if he holds a current flight instructor certificate; or

(b) A flight instructor certificate with a glider rating.

§ 61.180 Limitations.

(a) A certificated flight instructor may endorse a student pilot certificate for solo flight only if he determines that the holder has complied with section 61.63 or 61.71, as applicable, and is otherwise able to make solo flights.

(b) A certificated flight instructor may endorse a student pilot certificate for solo cross-country flight only if he determines that the holder has complied with section 61.65, 61.67, or 61.69, as applicable, and is otherwise able to make solo cross-country flights.

(c) A certificated flight instructor may endorse a student pilot certificate for solo flight in a different make or model of aircraft only if he determines that the holder can make solo flights safely in that aircraft.

(d) A certificated flight instructor may not authorize a student pilot to operate an aircraft in solo flight without first endorsing his student pilot certificate, unless it has previously been endorsed for that privilege by a certificated flight instructor.

(e) A certificated flight instructor may not give more than 8 hours of flight in-

struction a day nor more than 36 hours in any 7-day period.

The reporting and/or recordkeeping requirements contained herein have been approved by the Bureau of the Budget in accordance with the Federal Reports Act of 1942.

(Secs. 313(a), 601, and 602 of the Federal Aviation Act of 1958; 49 U.S.C. 1354, 1421, 1422)

Issued in Washington, D.C., on June 21, 1965.

N. E. HALABY,
Administrator.

[F.R. Doc. 65-6756; Filed, June 28, 1965; 8:45 a.m.]

[Docket No. 1186; Amdts. 23-1, 25-5, 43-2, 91-20]

PART 23—AIRWORTHINESS STANDARDS: NORMAL, UTILITY, AND ACROBATIC CATEGORY AIRPLANES

PART 25—AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY AIRPLANES

PART 43—MAINTENANCE, PREVENTIVE MAINTENANCE, REBUILDING, AND ALTERATION

PART 91—GENERAL OPERATING AND FLIGHT RULES

Altitude System Requirements

The purpose of this amendment to Parts 23, 25, 43, and 91 of the Federal Aviation Regulations is to increase safety and improve airspace utilization by revising design requirements dealing with airplane altimeter systems and by prescribing periodic inspections of systems installed in airplanes operating under IFR conditions. This action was published as a notice of proposed rule making (29 F.R. 3310) and circulated as notice 64-14 dated March 12, 1964.

The need for the amendment results from recognition that altimeter system accuracy depends on good system design and is adversely affected by operations at higher altitudes and at higher airspeeds. Further degradation of system accuracy occurs in service caused primarily by static pressure system leaks and by instruments that have deviated from their original calibrations.

Agency action to upgrade altimeter system accuracy began with notice of proposed rule making (27 F.R. 4340) circulated as Draft Release No. 62-22 dated April 27, 1962. Among other provisions, Draft Release 62-22 proposed that the accuracy of the altimeter system of each new type aircraft be determined by an in-flight calibration of a number of production aircraft, with further provisions for inservice checks of altimeter system performance. Because standard methods of calibration remained to be developed, and because the project scope indicated that the end result might best be achieved by increments in several separate rule making actions, Draft Re-

lease No. 62-22 was withdrawn as a notice of proposed rule making although it did state the Agency's long-range program to upgrade altimeter system performance. Notice No. 64-14, on which this amendment is predicated, accordingly was limited in scope to design and check of airplane static pressure systems and test of altimeters.

Subsequent to Notice No. 64-14, the Federal Aviation Agency recodification program was completed. As explained in the Notice, recodification has not altered the substance of the rules. CAR § 3.665 is now FAR § 23.1325; CAR § 4b.612(b) is now FAR § 25.1325; proposed CAR § 18.31 and a portion of proposed FAR § 91.170 have become FAR Part 43, Appendix E. The appropriate FAR identification will be used hereinafter.

In response to the notice of proposed rule making, the Agency received several comments objecting to the overall proposed changes. The main thrust of these unfavorable comments was that the new rules would impose costs disproportionate to resulting increases in reliability, utility, or safety and that the accident record of airplanes operated under the general operating rules did not justify the proposed changes.

The Agency must reject any contention that revised rules upgrading the accuracy of altimeter systems are unwarranted. Surveys have revealed that a high percentage of airplanes have leaky static pressure systems. Accident reports in certain instances have pointed to altimeter errors; in other unexplained accidents, errors in instruments dependent on static pressure source may not be ruled out as contributing causes. If increased safety and more effective airspace utilization are to be achieved, all airplanes operated in IFR conditions must meet the same altimeter system equipment installation standards to operate in controlled airspace.

The changes and comments relating to the various specific parts of the Federal Aviation Regulations are discussed in the following paragraphs.

FAR § 23.1325. The notice of proposed rule making provided that the influence of airplane characteristics not seriously affect the accuracy of instruments having static pressure connections, further specified certain static system design and installation details, required a system proof test, and made provision for countering icing conditions.

Section 23.1325(a) has been amended to specify that static pressure connections be vented so that external forces least affect instrument accuracy. This change relaxes the requirement of the notice and parallels the wording in the comparable section of Part 25.

One commentator would delete the system proof test on the grounds that it does not reveal errors caused by a poorly designed or located static source, and that, in any event, such small static leaks as it might divulge do not result in static system errors. The Agency, however, considers the proof test a necessary part of certification because, after the design is completed, system leakage becomes the major criterion which can-

not be ignored until its effect is proven inconsequential.

Two commentators objected to proof testing the static pressure system in each production airplane. The rule, however, does not require test of each production airplane although that would be one way to demonstrate conformity to the approved type design. As suggested by another commentator, sample testing and production flight check could be another acceptable means of showing conformity if there were a showing of an adequate quality control system and compliance with the equipment function and installation requirements of § 23.1301.

The Agency does not concur with various comments recommending that it adopt the Air Force static system leakage rate at an arbitrary specified altitude with associated instruments disconnected. Since many static system leaks occur at instrument disconnect points, it is considered that a realistic test for Part 23 airplanes should be made with the instruments connected. Section 23.1325 (b)(2) has been amended, however, to allow a reasonable leakage loss tolerance with associated instruments connected at the airplane maximum operating altitude.

With regard to negating the effect of icing conditions, one commentator recommended deleting the requirement altogether in low-performance airplanes operating under VFR conditions. Two other commentators recommended that a protected alternate source of static pressure be allowed, while a fourth recommended use of an optional ice-free static pressure source of less accuracy where calibration is given the pilot.

Since static vent icing may occur during both VFR and IFR conditions with hazardous consequences, the Agency believes there is ample justification for anti-icing as a certification requirement on all airplanes employing a static pressure system for required instruments. In response to the comments, the proposed rule has been expanded to permit the use of an alternate static source having a prescribed accuracy tolerance, and, where needed, a correction card.

FAR § 25.1325. The notice of proposed rule making altered the existing rule in part by adding an anti-icing provision, by specifying certain installation and design details plus a system proof test, and by allowing an altimeter correction device bypass instead of an alternate altimeter system.

Several commentators contended that the proof test would be unrealistic because no tolerance was provided and it was unclear whether the specified test pressure referred to differential or absolute pressure. Further comments variously recommended adoption of military requirements for leakage rate with associated instruments disconnected, adoption of a 400-foot per minute rate at 40,000 feet, and adoption of different system tolerances for pressurized and unpressurized airplanes. The Agency agrees with the comments concerning tolerance and pressure ambiguity, and, accordingly, has amended the requirement for type certification to include

proof test at a pressure differential corresponding to the certificated maximum operating altitude. The rule has been further amended to specify a reasonable maximum leak rate of 100 feet per minute with associated instruments connected. The Agency does not agree with the recommendation for different system tolerances for pressurized and unpressurized airplanes since an altimeter system must perform satisfactorily in the most critical range when the airplane pressurization system fails.

The Agency does not concur with the contention of one commentator that the notice is arbitrary in specifying that pressure remain unaltered when exposed to continuous and intermittent maximum icing conditions. An airplane is certificated for a certain severity of icing condition which applies to all required installations including the altimeter.

Further comments to the effect that automatic correction devices be required for high altitude—high speed airplanes and that correction cards be used where automatic correction devices are not available, were either beyond the scope of the notice or already covered by current functional and installation requirements.

It was suggested that the intent of the requirement for a correction device bypass or alternate systems be clarified. The Agency feels, however, that the objective of the requirement is adequately stated and that it would be impractical to be more specific in an attempt to cover all possible design features.

FAR Part 43, Appendix E. The notice of proposed rule making described new altimeter instrument tests for scale error, hysteresis, after effect, friction, case leak, position error, and barometric scale error.

In the interest of organizational unity, this appendix has been expanded to encompass the details of the static pressure system test and inspection as proposed in § 91.170 in addition to the altimeter instrument tests.

In response to several comments, the static pressure system leakage test has been amended to allow a leakage tolerance instead of the requirement that the system be leak free.

A number of commentators objected to the cost of upgrading altimeter standards and recommended that tests for scale error, hysteresis, and friction be limited to the maximum operating altitude of the airplane in which installed. The Agency concurs and the rule is amended accordingly.

One commentator suggested that all standard atmosphere data be taken from the same source. The Agency concurs and has used "U.S. Standard Atmosphere, 1962" as the sole source for altitude-pressure-tolerance values.

A comment contending that five test altitudes for low-performance airplanes is sufficient was not supported by any justification. Also a comment suggesting that test points be selected that fall precisely on the instrument 20-foot scale marks was considered unjustified since in normal test procedures, one quarter

of a scale division is not difficult to estimate.

The Agency agrees that the 12-hour rest period at 29.92 inches Hg is an unnecessary hardship and has deleted it as a preliminary requirement in the scale error test.

One commentator recommended deletion of tests for hysteresis, after effect, friction, position error, and barometric scale error since scale error and case leak tests are sufficient to determine if the altimeter should be returned to service. Another comment stated that the barometric scale error test was too extensive. The Agency concurs that the position error test is unnecessary and it has been deleted. Other relief has been afforded by changing specified test points in the hysteresis test and reducing the barometric scale error test to only eight test pressures. The tests for hysteresis, after effect, friction, and barometric scale error are considered essential for checking the quality of the instrument and its indicating accuracy consistency and, therefore, have not been deleted.

The Agency did not adopt a recommendation that the 20,000 feet per minute rate of pressure change for the scale error test be reduced since no justification was presented.

Several commentators suggested creating new classes or categories of altimeters for different altitude ranges, with less stringent test criteria for those operating at the lower altitudes. The Agency does not concur in these recommendations since, for IFR operation, altimeter system test standards must be the same for all airplanes regardless of altitude of operation or whether the airplane is pressurized.

The Agency agrees with a recommendation that the altimeter be vibrated to remove friction effect before taking test readings and has amended the test procedure accordingly. However, a further recommendation that the vibration frequency be specified, if adopted, would impose an unnecessary burden since the purpose of vibration is to eliminate errors due to friction within the instrument.

In reply to a comment pointing to the impracticality of conducting each altimeter test at 29.92 inches Hg and 25 degrees C, the final rule has been changed so as to delete the 29.92 inches Hg pressure requirement and to prescribe appropriate allowances to be made when test temperatures are substantially different from an ambient of 25 degrees C.

FAR § 91.170. The notice of proposed rule making proposed this new requirement to provide for repetitive checks of the static pressure system in all general aviation airplanes and of altimeter instruments installed in airplanes operating under IFR conditions other than those coming under Part 121.

The amended § 91.170 properly charges the operator with responsibility for ensuring that the airplane has been tested and inspected prior to flight in IFR conditions. The specific static pressure system test requirements have been removed from this section and incorporated into Part 43, Appendix E in order

that the complete altimeter system test and inspection procedure be contained under one appropriate heading.

Three commentators indicated some confusion between the proposed 2-year inspection and the periodic airworthiness inspection of § 91.169 for aircraft having dual altimeters. New § 91.170 has been reworded to delete reference to periodic inspections and emphasize that the biennial special altimeter system inspection is a requirement independent of the annual or 100-hour inspection required by § 91.169. The final rule also emphasizes that each static system of a dual system, as well as each altimeter instrument, is to be inspected.

Two commentators pointed to hardships due to a shortage of Class I instrument repair stations. It is the Agency's position, however, that the new inspection requirements impose no undue hardship on operators since the inspection interval is long, and operations may be scheduled to place airplanes at repair stations. In any event, only IFR operations would be curtailed should the required inspection not take place. Some relief is afforded in the final rule by permitting the altimeter tests to be made by an appropriately rated repair facility rather than a certificated Class I instrument rated repair station.

Several commentators recommended in effect that the rule be extended to prescribe accuracy tolerances and periodic accuracy checks of instruments used in VFR conditions. While the recommendations have merit, they go beyond the scope of present rule making. Under the current regulations, when VFR flight conditions prevail, collision avoidance is primarily dependent on visual means rather than vertical separation by altimeter information.

The final rule has been changed to provide for a § 91.170 compliance date 1 year from the effective date of the amendment.

Interested persons have been afforded an opportunity to participate in the making of this amendment. All relevant matter submitted has been fully considered.

In consideration of the foregoing, Parts 23, 25, 43, and 91 of the Federal Aviation Regulations are amended effective July 29, 1965, as set forth below.

(Secs. 313(a), 601, and 603 of the Federal Aviation Act of 1958; 49 U.S.C. 1354(a), 1421, 1422)

Issued in Washington, D.C., on June 21, 1965.

N. E. HALABY,
Administrator.

1. Section 23.1325 is amended to read as follows:

§ 23.1325 Static pressure system.

(a) Each instrument provided with static pressure case connections must be so vented that the influence of airplane speed, the opening and closing of windows, airflow variations, moisture, or other foreign matter will least affect the accuracy of the instruments except as noted in paragraph (b)(3) of this section.

(b) If a static pressure system is necessary for the functioning of instruments,

systems, or devices, it must comply with the provisions of subparagraphs (1) through (3) of this paragraph.

(1) The design and installation of a static pressure system must be such that—

(i) Positive drainage of moisture is provided;

(ii) Chafing of the tubing, and excessive distortion or restriction at bends in the tubing, is avoided; and

(iii) The materials used are durable, suitable for the purpose intended, and protected against corrosion.

(2) A proof test must be conducted to demonstrate the integrity of the static pressure system by evacuating the static pressure system until the pressure differential corresponds to that which would exist at the maximum altitude for which the airplane is type certificated, and by demonstrating that this pressure differential is maintained, without additional pumping for a period of 1 minute, with a loss not to exceed the equivalent of 100 feet of altitude.

(3) If a static pressure system is provided for any instrument, device, or system required by the operating rules of this chapter, each static pressure port must be designed or located in such manner that the correlation between air pressure in the static pressure system and true ambient atmospheric static pressure is not altered when the aircraft encounters icing conditions. An anti-icing means or an alternate source of static pressure may be used in showing compliance with this requirement. If the reading of the altimeter on the alternate static pressure system exceeds a 2 percent tolerance, a correction card may be used to show compliance with this requirement.

2. Section 25.1325 is amended by amending the catchline to read as follows, by amending paragraphs (b) and (c) to read as follows, and by adding a new paragraph (f) to read as follows:

§ 25.1325 Static pressure systems.

(b) Each static port must be designed and located in such manner that the static pressure system performance is least affected by airflow variation, or by moisture or other foreign matter, and that the correlation between air pressure in the static pressure system and true ambient atmospheric static pressure is not changed when the airplane is exposed to the continuous and intermittent maximum icing conditions defined in Appendix C of this part.

(c) The design and installation of the static pressure system must be such that—

(1) Positive drainage of moisture is provided; chafing of the tubing and excessive distortion or restriction at bends in the tubing is avoided; and the materials used are durable, suitable for the purpose intended, and protected against corrosion; and

(2) It is airtight except for the port into the atmosphere.

A proof test must be conducted to demonstrate the integrity of the static pressure system. The proof test must be performed by evacuating the static pres-

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sure system until the pressure differential corresponds to the pressure differential that would exist at the maximum altitude for which the airplane is type certificated and by demonstrating that this pressure differential is maintained, without additional pumping, for a period of 1 minute with a loss not to exceed 100 feet.

(f) If an altimeter system is fitted with a device that provides corrections to the altimeter indication, the device must be designed and installed in such manner that it can be bypassed when it malfunctions, unless an alternate altimeter system is provided. Each correction device must be fitted with a means for indicating the occurrence of reasonably probable malfunctions, including power failure, to the flight crew. The indicating means must be effective for any cockpit lighting condition likely to occur.

3. Part 43 is amended by adding the following new appendix:

APPENDIX E

ALTIMETER SYSTEM TEST AND INSPECTION

Each person performing the altimeter system tests and inspections required by § 91.170 shall comply with the following:

(a) Static pressure system:

(1) Ensure freedom from entrapped moisture and restrictions.

(2) Determine that leakage is within the tolerances established in § 23.1325 or § 25.1325, whichever is applicable.

(3) Determine that the static port heater, if installed, is operative.

(4) Ensure that no alterations or deformations of the airframe surface have been made that would affect the relationship between air pressure in the static pressure system and true ambient static air pressure for any flight condition.

(b) Altimeter:

(1) Test by an appropriately rated repair facility in accordance with the following subparagraphs. Unless otherwise specified, each test for performance may be conducted with the instrument subjected to vibration.

When tests are conducted with the temperature substantially different from ambient temperature of approximately 25 degrees C., allowance shall be made for the variation from the specified condition.

(i) *Scale error.* With the barometric pressure scale at 29.92 inches of mercury, the altimeter shall be subjected successively to pressures corresponding to the altitude specified in Table I up to the maximum normally expected operating altitude of the airplane in which the altimeter is to be installed. The reduction in pressure shall be made at a rate not in excess of 20,000 feet per minute to within approximately 2,000 feet of the test point. The test point shall be approached at a rate compatible with the test equipment. The altimeter shall be kept at the pressure corresponding to each test point for at least 1 minute, but not more than 10 minutes, before a reading is taken. The error at all test points must not exceed the tolerances specified in Table I.

(ii) *Hysteresis.* The hysteresis test shall begin not more than 15 minutes after the altimeter's initial exposure to the pressure corresponding to the upper limit of the scale error test prescribed in subparagraph (i); and while the altimeter is at this pressure, the hysteresis test shall commence. Pressure shall be increased at a rate simulating a descent in altitude at approximately (but not exceeding) 20,000 feet per minute until within 3,000 feet of the first test point (50 percent of maximum altitude). The test

point shall then be approached at a rate of approximately 3,000 feet per minute. The altimeter shall be kept at this pressure for at least 5 minutes, but not more than 15 minutes, before the test reading is taken. After the reading has been taken, the pressure shall be increased further, in the same manner as before, until the pressure corresponding to the second test point (40 percent of maximum altitude) is reached. The altimeter shall be kept at this pressure for at least 1 minute, but not more than 10 minutes, before the test reading is taken. After the reading has been taken, the pressure shall be increased further, in the same manner as before, until atmospheric pressure is reached. The reading of the altimeter at either of the two test points shall not differ by more than the tolerance specified in Table II from the reading of the altimeter for the corresponding altitude recorded during the scale error test prescribed in subparagraph (i).

(iii) *After effect.* Not more than 5 minutes after the completion of the hysteresis test prescribed in subparagraph (ii), the reading of the altimeter (corrected for any change in atmospheric pressure) shall not differ from the original atmospheric pressure reading by more than the tolerance specified in Table II.

(iv) *Friction.* The altimeter shall be subjected to a steady rate of decrease of pressure approximating 750 feet per minute. At each altitude listed in Table III, the change in reading of the pointers after vibration shall not exceed the corresponding tolerance listed in Table III.

(v) *Case leak.* The leakage of the altimeter case, when the pressure within it corresponds to an altitude of 18,000 feet, shall not change the altimeter reading by more than the tolerance shown in Table II during an interval of 1 minute.

(vi) *Barometric scale error.* At constant atmospheric pressure, the barometric pressure scale shall be set at each of the pressures (falling within its range of adjustment) that are listed in Table IV, and shall cause the pointer to indicate the equivalent altitude difference shown in Table IV with a tolerance of 25 feet.

(2) Altimeters which are of the air data computer type with associated computing systems may be tested in parts, by major components, to specifications developed by the manufacturer and acceptable to the Administrator.

(c) Records: Comply with the provisions of § 43.9 of this chapter as to content, form, and designation of the records.

TABLE I

(Ref: U.S. Standard Atmosphere, 1962)

ALTITUDE V. PRESSURE

Altitude (feet)	Equivalent pressure (inches of mercury)	Tolerance (feet)
-1,000	31.02	±20
0	29.92	20
500	29.38	20
1,000	28.86	20
1,500	28.33	25
2,000	27.82	30
2,500	27.30	30
3,000	26.78	35
3,500	26.26	40
4,000	25.74	40
4,500	25.22	40
5,000	24.70	40
5,500	24.18	40
6,000	23.66	40
6,500	23.14	40
7,000	22.62	40
7,500	22.10	40
8,000	21.58	40
8,500	21.06	40
9,000	20.54	40
9,500	20.02	40
10,000	19.50	40
10,500	18.98	40
11,000	18.46	40
11,500	17.94	40
12,000	17.42	40
12,500	16.90	40
13,000	16.38	40
13,500	15.86	40
14,000	15.34	40
14,500	14.82	40
15,000	14.30	40
15,500	13.78	40
16,000	13.26	40
16,500	12.74	40
17,000	12.22	40
17,500	11.70	40
18,000	11.18	40
18,500	10.66	40
19,000	10.14	40
19,500	9.62	40
20,000	9.10	40
20,500	8.58	40
21,000	8.06	40
21,500	7.54	40
22,000	7.02	40
22,500	6.50	40
23,000	5.98	40
23,500	5.46	40
24,000	4.94	40
24,500	4.42	40
25,000	3.90	40
25,500	3.38	40
26,000	2.86	40
26,500	2.34	40
27,000	1.82	40
27,500	1.30	40
28,000	0.78	40
28,500	0.26	40
29,000	0.00	40

TABLE II

TEST TOLERANCES

Test	Tolerance (feet)
Case Leak Test	±100
Hysteresis Test:	
First Test Point (50 percent of maximum altitude)	75
Second Test Point (40 percent of maximum altitude)	75
After Effect Test	30

TABLE III

FRICTION

Altitude (feet)	Tolerance (feet)
1,000	±70
2,000	70
3,000	70
5,000	70
10,000	80
15,000	90
20,000	100
25,000	120
30,000	140
35,000	160
40,000	180
50,000	250

TABLE IV

PRESSURE-ALTITUDE DIFFERENCE

Pressure (inches of Hg)	Altitude difference (feet)
28.10	-1737
28.50	-1340
29.00	-863
29.50	-392
29.92	0
30.50	+531
30.90	+893
30.99	+974

4. Part 91 is amended as follows:

(a) Section 91.161(b) is amended by adding the reference "91.170" between the references "91.169" and "91.171."

(b) By adding the following new section after § 91.169:

§ 91.170 Altimeter system tests and inspections.

(a) No person may operate an airplane in controlled airspace under IFR unless, within the preceding 24 calendar months, each static pressure system and each altimeter instrument has been tested and inspected and found to comply with Appendix E of Part 43. The altimeter must be tested by an appropriately rated repair station.

(b) Compliance with this section is not required until August 1, 1966.

[F.R. Doc. 65-6757; Filed, June 28, 1965; 8:45 a.m.]

[Docket No. 2673; Amdt. 37-2; Technical Standard Order C-63a]

PART 37—TECHNICAL STANDARD ORDER AUTHORIZATIONS

Airborne Weather Radar Equipment

The purpose of this amendment is to incorporate new environmental test procedures, which were developed to be more compatible with existing and anticipated aircraft environmental conditions, into the present minimum performance standards for airborne weather radar equipment operating within the radio-frequency bands of 5,350 to 5,470 Mc. and 9,300 to 9,500 Mc. This amendment also revises the minimum performance standards to require a minimum range capa-